International Textile and Apparel Association (ITAA) Annual Conference Proceedings

2017: Anchored by our Past, Navigating our Future

Jan 1st, 12:00 AM

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A study on the design development of gloves for fire investigations

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Keywords: Fire investigations gloves, design prototype, living lab

Introduction

The role of firefighters at the scene can be separated into various activities such as fire suppression, rescue, investigation, etc (Hine, 2004). A firefighter's personal protective equipment has been regulated according to performance and design requirements that are standardized to protect body parts from potentially dangerous elements at the scene. In the case of fire investigations, since the administrative purposes for arranging fire prevention and countermeasures are emphasized, studies mostly focus on the schemes or operations while the importance of studies on the design of protective equipment has been largely overlooked(Kim & Park, 2014; Ko & Lee, 2009). Hence, the aim of this paper is to clarify fire investigators' design needs for their fire investigation gloves and to determine key design elements which could provide the best compromise between protection and work efficiency.

Methods

The study manages a living lab, which is a research concept of a user-centered, innovative co-operating system, often conducting wear trials and in-depth interviews with advisory groups (Bergvall-Kareborn & Stahlbrost, 2009). The study selects 6 types of popular fire investigation gloves from four nations (USA, Japan, Germany, and Korea). In order to examine differences between gloves in more detail, wearer trials and in-depth interviews were conducted with 3 fire investigators drawn from South Korean based fire stations on November 4th and December 17th 2015. Also, a survey was conducted on 313 fire investigators from November 29th to December 21th 2015, to analyze the design needs for their gloves. Finally, a prototype of the fire

investigation gloves was developed and a wearability evaluation was carried out on 33 fire fighters to assess the satisfaction levels of the design and functions of the gloves.

Finding & Discussion

In general, protection and work efficiency issues were identified as a major concern regarding the fire investigation gloves. The gloves need to protect the hands in case of potential hazards from sharp objects found while filtering through ash and to still maintain the tactile senses of the fingertips to pick up tiny objects. Also, there were demands for a design to allow the gloves to be taken off and put on easily in cases where the investigator has to frequently report to base during identification activities. The study helped develop a design prototype that utilized an adjusting device onto a band long enough to cover the wrist area, included a weaved in dyneema knit with polyethylene thread which is light and strong, and applied a polyurethane coating on the palm area to create gloves for fire investigation specializing in identification through enhanced cut resistance and dexterity. As a result of conducting a user evaluation on the prototype through Living Lab, 50% of the respondents found the strength of the gloves to have increased compared to the existing ones and the inconveniences when wearing the gloves had improved overall.

Funding This work was supported by MSIP(Ministry of Science, ICT and Future Planning) Grant funded by the Societal Challenges for Citizen Research Program

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